ORDER

6750.56

MARK IB/C INSTRUMENT LANDING SYSTEM (ILS)
SERVICE LIFE EXTENSION PROJECT (SLEP)
PROJECT IMPLEMENTATION PLAN (PIP)

August 11, 1994

U.S. DEPARTMENT OF TRANSPORTATION
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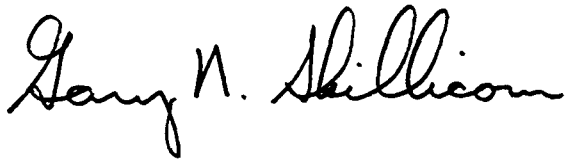
RECORD OF CHANGES

DIRECTIVE NO. 6750.56

CHANGE TO BASIC	SUPPLEMENT			OPTIONAL	CHANGE TO BASIC	SUPPLEMENTS			OPTIONAL

FOREWORD

This order documents the project implementation plan (PIP) for the Mark IB/C Instrument Landing System (ILS) Service Life Extension Project (SLEP). It defines the scope, major functional responsibilities, management direction, and overall program guidance to all responsible levels within the Federal Aviation Administration (FAA).



Gary N. Skillicorn
Program Manager for Landing

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CHAPTER 1. GENERAL

1. PURPOSE. This order transmits the project implementation plan (PIP), providing technical guidance and direction for the implementation of Mark IB/C Instrument Landing System (ILS) Service Life Extension Project (SLEP). It establishes program management, implementation policy, and responsibilities governing the activities of organizations. This PIP is organized and presented in accordance with FAA-STD-036a, Preparation of Project Implementation Plans.

2. DISTRIBUTION. This order is distributed to division level in the office of the Program Director for Navigation and Landing, Systems Maintenance, and Associate Administrator for Contracting and Quality Assurance; to branch level in the regional Airway Facilities divisions, the Federal Aviaiton Administration (FAA) Logistics Center, and the FAA Academy at the Mike Monroney Aeronautical Center; and limited distribution to the Airway Facilities (AF) General National Airspace System (GNAS) sectors, sector field offices, sector field units, and sector field office units.

3. DEFINITIONS. The following acronyms/abbreviations are used:

AF	Airway Facilities
ARMS	Airport Remote Monitoring System
CO	Contracting Officer
DRR	Deployment Readiness Review
EEM	Electronic Equipment Modification
ILS	Instrument Landing System
LRU	Lowest Replaceable Unit
NAILS	National Airspace Integrated Logistics Support
PIP	Project Implementation Plan
QRO	Quality Reliability Officer
SLEP	Service Life Extension Project

4. AUTHORITY TO CHANGE THIS ORDER. The Program Manager for Landing, ANN-200, is the approval authority for all changes to this order.

5. UPDATE AND REVISION COMMITMENT. Not applicable.

6-19. RESERVED.

CHAPTER 2. PROJECT OVERVIEW

20. SYNOPSIS. The Mark IB/C ILS SLEP project consists of incremental replacements of rack-mounted and related assemblies/subassemblies and/or components with more modern and supply-supportable equivalent functional units.

a. Initially, two separate procurements are planned. The first will provide transmitters and power supplies. The second will provide monitors, detectors, control units, 8/14 element localizer distribution (DU)/recombination (RU) boxes, and any necessary associated circuitry. The procurements will be via competitive sealed bids to produce units identical to Mark IF hardware, defined by FAA-owned Mark IF drawings. Subsequent procurements may provide additional subassemblies, such as cable troughs, wattmeter panels, etc.

b. Transmitters, power supplies, monitors, control units, and detectors will be shipped to the Logistics Center to await ordering by the regions for installation by electronic equipment modification (EEM). The localizer DU/RU boxes will also be shipped to the Logistics Center to support optional conversion by the regions of existing 15-element V-Ring antenna arrays to either 8- or 14-element configurations. Any hardware obtained from subsequent procurements will be direct-shipped to individual sites or stored at the Logistics Center, as appropriate.

21. PURPOSE. The purpose of the Mark IB/C SLEP is to replace major subassemblies of the Mark IB/C electronics equipment (1960's design) with current design/production Mark IF-like equipment.

22. HISTORY. The relevant history for the Mark IB/C SLEP is contained in the BACKGROUND paragraph of a staff study (Appendix 1) prepared by a group of regional ILS engineers. (Mark IA systems will be replaced by the Category I ILS procurement for which contract award (CA) is expected in FY-94.)

23-29. RESERVED.

30. ILS FUNCTIONAL DESCRIPTION. The Mark IB/C ILS equipment provides instrument approach guidance to aircraft to a height above touchdown of not less than 200 feet and with runway visual range (RVR) of not less than 2,400 feet. An ILS typically consists of a localizer, a glide slope, marker beacons, and monitor and control equipment. Other electronic facilities that may be used with an ILS include compass locators and/or distance measuring equipment (DME). The latter two equipments are not included in this project.

a. First Procurement. The first procurement of the SLEP will provide localizer and glide slope main transmitters, glide slope clearance transmitters for capture effect sites, and power supplies. These items will be shipped to the Logistics Center. Installation will be accomplished by local maintenance personnel as directed in an EEM.

1. Transmitters. Since Mark IB sites already have Mark IF localizer and glide slope main transmitters, they will not receive any new transmitters except for capture effect glide slopes, which will receive a replacement clearance transmitter.

2. Power Supplies. All Mark IB/C sites will receive new power supplies. At Mark IB sites with Mark IF transmitters, these supplies will replace the Lambda supplies provided earlier for the existing Mark IF transmitters.

b. Second Procurement. The second procurement of the SLEP will provide localizer and glide slope monitors, control units, and associated circuitry. These items will be shipped to the Logistics Center. Installation will be accomplished by local maintenance personnel as directed in an EEM. A follow-on procurement will obtain complete 8- or 14-element localizer DU/RU boxes and associated circuitry for optional conversion of 15-element V-Ring arrays to 8- or 14-element configurations. These boxes will be shipped to the Logistics Center for storage and await region/site ordering.

1. Monitors, Control Units and Detectors. All Mark IB/C sites will receive new monitors, control units, and detectors. The power supply provided by the first SLEP procurement will be used for these new assemblies.

2. Localizer DU/RU Boxes and Cable Troughs . A sufficient quantity of boxes (see Appendix 2) will be ordered

for subsequent (optional) regional accomplishment of a 15-element V-Ring antenna array conversion to either an 8- or 14-element array. The box will be complete, using components identical to a Mark IF box but in a newly-designed enclosure, except that the detectors will have been shipped to the site with the monitor and the RF stripline recombining circuit is already existing at V-Ring sites. The old V-Ring distribution box will be disposed of according to the implementing EEM instructions. A complete new set of trough metalwork will be provided. Instruction book TI 6750.161, describing the standard conversion to an 8-element array, will be updated and reissued following testing of the proposed configuration and will contain instructions for the 14-element array.

3. Site Wiring. At sites where an existing Mark IB/C 15-element V-Ring array will be optionally converted to either the 8- or 14-element configuration, it is likely that additional audio/DC pairs will be necessary between the array and the equipment shelter. These pairs provide DC to the DU/RU box and carry misalignment and cable fault signals to the shelter. They also will carry the detected audio signals from the course and width monitor detectors to the shelter, if the region chooses not to use existing coaxial cables for that purpose. Details will be provided in TI 6750.161, Localizer Antenna Array.

4. Battery Power. Mark IB/C sites do not operate on battery power, unless a regionally-procured uninterruptible power supply (UPS) has been installed for the existing AC-powered racks. If an UPS is present, it may be retained and used with the new equipment. Regions wishing direct power to the new transmitters and monitors from batteries may do so by installing no-maintenance batteries and a battery box. This program will not provide batteries, boxes, or installation materials, but funding is available under project authorization for regional purchases.

c. EEM. The EEM's will be developed by Operational Support Directorate, National Airway Systems Engineering Division, AOS-200, and will include equipment instruction books and an installation kit to connect the power supply to the transmitters, monitor, and associated circuits, and all required hardware (brackets, slides, cable retractors, etc.) for mounting new components.

d. Flight Inspection. As defined by Order 6750.49, Maintenance of ILS Systems, flight inspection is not necessary when replacing the transmitters or monitors, unless the (already required) traceable reference data is not available. A full commissioning-type inspection will be required if a 15-element V-Ring array is converted to the 8- or 14-element configuration and should be scheduled to take advantage of a regularly scheduled "periodic with monitors" inspection.

e. Spares. Since the equipment to be procured is already in the FAA inventory, the depot spares quantities will be procured for all line repairable units (LRU) at the level consistent with current requirements. Site spares will be procured on a modified one-for-one basis for all LRU's.

f. Follow-on Procurements. Although not currently defined, additional procurements may provide additional replacement assemblies, such as cable troughs, wattmeter panels, etc. These may be purchased by Operational Support Directorate, Nav/COM Support Engineering Branch, AOS-240, and provided as EEM kits.

g. Airport Remote Monitoring System (ARMS). Some of the SLEP assemblies may be delivered in ARMS-ready condition, according to the most recent FAA-owned Mark IF drawings. Those assemblies not delivered ready for ARMS may be modified by the region per the standard ARMS EEM at existing Mark IB/C sites where remote monitoring is considered necessary. The SLEP will not provide kits or funding for ARMS at Mark IB/C sites.

31. PHYSICAL DESCRIPTION. Equipment purchased for this project will be equivalent in function to corresponding Mark IB/C assemblies and identical to existing Mark IF assemblies of the same type.

32. SYSTEM REQUIREMENTS. The SLEP will not change existing Mark IB/C requirements.

33. INTERFACES. Not applicable.

34-39. RESERVED.

CHAPTER 4. PROJECT SCHEDULE AND STATUS

40. PROJECT SCHEDULES AND GENERAL STATUS. The Mark IB/C SLEP began in mid-1992 with the convening by the Program Manager for Landing, ANN-200, of a workgroup composed of participants from all regions and appropriate national offices. Appendix 1 is a copy of the brief staff study produced by that workgroup, defining the recommended approach to the SLEP. Early in 1993, the Instrument Landing Systems Engineering Division (ANN-400) personnel began work on the drawings review necessary to support sealed bid contracts; initial CA is expected approximately March 1994.

41. MILESTONE SCHEDULE SUMMARY. The project schedule is defined below. Project events will be scheduled in relationship to the dates of CA. The dates listed are for anticipated milestones.

SLEP Phase 1	
Transmitter/power supply CA	03/94
First Article(s) delivery	CA + 10 mo.
Production delivery begins	CA + 16 mo.
SLEP Phase 2	
Monitor/Detectors/DU/RU/CU CA	09/94
First Article(s) delivery	CA + 10 mo.
Production delivery begins	CA + 16 mo.
Subsequent CA	TBD

Long-lead Parts. A number of parts necessary to build the assemblies in the first two procurements have a delivery time exceeding 7 months, which drives the schedule for first article deliveries. At CA, the vendor will be given approval to order production quantities of long-lead parts to minimize the time to production.

42. INTERDEPENDENCIES AND SEQUENCE. Because the SLEP affects only assemblies within the existing Mark IB/C equipment, only one interdependency exists with other projects--the procurement of Log Periodic Dipole Array antenna systems to replace existing

Antenna Products Company Traveling Wave Array antenna systems. These two projects are asynchronous--any given ILS site may receive the replacement antenna array before or after receiving some or all of the SLEP assemblies.

43-49. RESERVED.

CHAPTER 5. PROJECT MANAGEMENT

50. PROJECT MANAGEMENT, GENERAL. This chapter describes the organizations within the Office of the Program Director for Navigation and Landing that are directly responsible for the Mark IB/C ILS SLEP project management.

a. Program Director for Navigation/Landing, ANN-1. The Program Director for Navigation/Landing manages, directs, and executes the FAA's engineering and management activities related to facilities design, air navigation, landing aids, and air traffic control facilities and equipment to ensure that the NAS is efficient, economical, and responsive to operational needs.

b. Program Manager for Landing, ANN-200. The Program Manager for Landing is the principal element of the directorate responsible for managing the procurement of landing systems.

c. Division Manager for ILS Engineering, ANN-400. The Division Manager for ILS Engineering is the principal element of the division responsible for design, development, and implementation of ILS's.

d. Associate Program Manager for Engineering (APME), ANN-400. The APME serves as technical officer for the contract and coordinates project implementation.

e. Associate Program Manager for Contracting (APMC), ASU-310. The APMC is a contracting officer with the authority to enter into, administer, or terminate contacts and make related determinations and findings to the program manager.

f. Associate Program Manager for Quality (APMQ), ASU-420. The APMQ performs on-site, in-plant quality and reliability support at contractors' and subcontractors' facilities and performance locations in support of the program manager.

51. PROJECT CONTACTS. This paragraph lists the Mark IB/C SLEP project contacts and their addresses.

a. Acting Program Director for Navigation/Landing. Donald A. Stadtler, ANN-1, FAA, 800 Independence Avenue, SW., Washington, DC 20591, FTS 267-6531, Commercial (202) 267-6531.

b. Program Manager for Landing. Gary Skillicorn, ANN-200, FAA, 800 Independence Avenue, SW., Washington, DC 20591, FTS 267-6675, Commercial (202) 267-6675.

c. Division Manager for ILS Engineering. Ken Harris, ANN-400, FAA, 800 Independence Avenue, SW., Washington, DC 20591, FTS 267-6563, Commercial (202) 267-6563.

d. APME. Mike Rivers, ANN-400, FAA, 800 Independence Avenue, SW., Washington, DC 20591, FTS 267-6543, Commercial (202) 267-6543.

e. Associate Program Manager for Logistics (APML). Linda Litchfield, ALM-600, FAA, 800 Independence Ave, SW., Washington, DC 20591, FTS 267-3756, Commercial (202) 267-3756.

52. PROJECT COORDINATION. The SLEP requires coordination with other services within the FAA and with regional representatives. Coordination by and with the organizations below is essential for them to accomplish their functions.

a. Maintenance Engineering Division (ASM-100). ASM-100 provides technical oversight and consulting to the Systems Maintenance Service and represents the regions' maintenance interests.

b. Maintenance Operations Division (ASM-200). ASM-200 ensures the project is in conformance with staffing, training, certification policies, guidelines, and requirements. Because the SLEP merely replaces major assemblies with units identical in form, fit, and function to existing fielded assemblies at Mark IF sites, no changes in these areas are anticipated.

c. Operational Support Directorate (AOS-200). AOS-200 will develop all necessary documentation (e.g., EEM's, instruction book changes, etc.) to implement the SLEP.

d. National Airspace Integrated Logistics Support (NAILS) Implementation Branch (ANS-420). ANS-420 will coordinate the development of an integrated logistics support plan (ILSP) for the SLEP acquisition.

e. NAS Support Division (ASM-700). ASM-700 develops, recommends, and issues policy procedures, standards, and policies for material, supply, and property management. This division also develops the required logistics policies, plans, and standards required to support the NAILS process.

f. Contracts Division (ASU-300). ASU-300 does cost/price analyses of contractors' proposals and participates as a member of the Source Evaluation Board for the SLEP. ASU-300 also provides procurement support for the ILS programs and plans, places, and administers contracts for the ILS equipment. In addition, ASU-300 designates a contracting officer (CO) who is responsible for all contractual matters. The CO is the only individual authorized to approve contract changes affecting price, delivery, or schedule.

g. Industrial Division (ASU-400). ASU-400 will provide an APMQ to provide the quality assurance service to the program manager. ASU-400 also assigns a Quality Reliability Officer (QRO) who is the FAA's representative at the contractor's facility responsible for verifying quality control. After CA, the assigned QRO will also serve as the APMQ. The QRO is directed by FAA policy and procedure and by the terms and conditions of the contract. In addition, ASU-400 shall provide industrial engineering services to support the ILS Program.

h. FAA Logistics Center (AML-400). AML-400 manages the distribution of equipment for the ILS sites receiving SLEP assemblies. The FAA Logistics Center provides repair of items that require specialized repair procedures, test equipment/tools, diagnostic hardware/software, and major shop facilities. It also provides all other FAA Logistics Center functions as set forth in the NAILS Master Plan.

i. FAA Aviation Standards National Field Office. The FAA Aviation Standards National Field Office is responsible for accomplishing flight inspections and related activities.

h. FAA Regional Offices. The FAA regional Airway Facilities Divisions (AXX-400) are responsible for installing, maintaining, modifying, and operating facilities, systems, and equipment in accordance with established standards, specifications, and instructions.

i. Airway Facilities Sector. The sectors are responsible for accomplishing EEM's.

53. PROJECT RESPONSIBILITY MATRIX. Figure 5-1, Project Responsibility Matrix, illustrates the FAA organizations responsible for the implementation of each significant function of the SLEP project.

54. PROJECT MANAGERIAL COMMUNICATIONS. The SLEP APME within ANN-400 is the focal point for all internal project communication. Organizations supporting the project designate a representative to maintain close communication with the ILS Program Office. Supporting organizations maintain communications within the FAA but never directly with the contractor without the CO's permission. Program oversight and coordination will be accomplished through scheduled Program Overview Meetings, Technical Interchange Meetings, and other contractually-defined meetings.

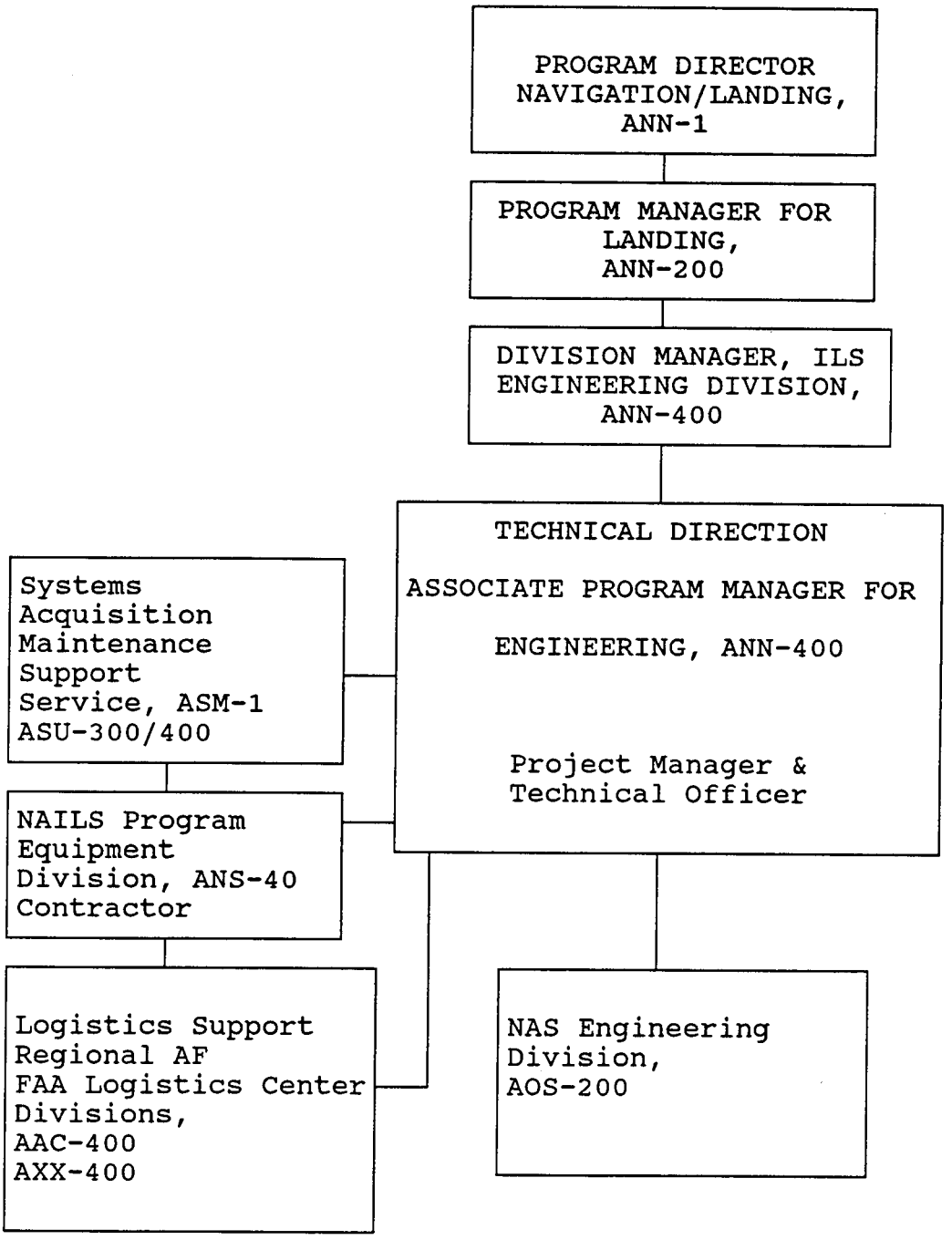
55. IMPLEMENTATION STAFFING. There are no personnel requirements peculiar to the implementation phase of the project, other than accomplishment of the EEM's, each of which is expected to require fewer than 16 hours.

56. PLANNING AND REPORTS.

a. Planning. For project planning purposes, each region will be asked to provide the ANN-400 office a list of prioritized Mark 1B/C locations for direct shipment of some of the SLEP hardware. ANN-400 has begun informal coordination with each region on the development of a database of site-specific SLEP needs. A summary of our current information is appended to this PIP for regional markup.

b. Reports. No formalized reports are required for this project. However, ANN-400 will publish informational memoranda to all affected organizations when considered appropriate. Project status will be reported in the Quarterly ANN Navigation/Landing Newsletter.

FIGURE 5-1 -- PROJECT RESPONSIBILITY MATRIX



57. APPLICABLE DOCUMENTS. Within this order, the following documents are applicable (version numbers and dates as current at the time of issuance of this PIP):

a. FAA-STD-036a, Preparation of Project Implementation Plans.

b. Order 1800.8, National Airspace System Configuration Management.

c. Order 1800.58, National Airspace Integrated Logistics Support (NAILS) Policy.

d. Order 6000.15, General Maintenance Handbook for Airway Facilities.

e. Order 6030.45, Facility Reference Data File.

f. Order 6750.49, Maintenance of Instrument Landing Systems (ILS).

g. TI 6750.161, Localizer Antenna Array, Eight Element V-Ring.

58-59. RESERVED.

CHAPTER 6. PROJECT FUNDING

60. PROJECT FUNDING STATUS, GENERAL. Funding for fiscal years 1994/95 Mark IB/C SLEP procurements is supplied under Capital Investment Plan 44-22. It is anticipated that funds will be available when needed.

61-69. RESERVED.

CHAPTER 7. DEPLOYMENT

70. GENERAL DEPLOYMENT ASPECTS. Deployment of the Mark IB/C SLEP hardware is administered by the program manager and staff. After completion of in-factory testing, equipment from each procurement will be shipped to the Logistics Center. Installation of the equipment is the responsibility of the region.

71. DEPLOYMENT READINESS REVIEW (DRR). A formal DRR is required. It is anticipated that some configuration management documents will need to be updated. (For example, some Mark IF piece parts may no longer be available from the manufacturer and will be replaced by current versions. In all cases, forward and backward compatibility at the LRU level will be maintained.)

72. SITE PREPARATION. Not applicable.

73. DELIVERY. The SLEP hardware will be shipped to the Logistics Center where it will await ordering for installation by EEM.

74. INSTALLATION PLAN. Installation of the SLEP assemblies in place of like and existing Mark IB/C assemblies will be via EEM by local sector personnel (specifically for the first two procurements of power supplies, transmitters, monitors, and detectors). Optional conversion of existing 15-element V-Ring arrays to either 8- or 14-element configuration will be done by the regions under program(s) of their choosing, using SLEP-supplied localizer DU/RU boxes and striplines.

75-79. RESERVED.

CHAPTER 8. VERIFICATION

80. FACTORY VERIFICATION. The SLEP equipment manufacturer will perform production tests of LRU's and assemblies using FAA-provided test specifications, procedures, and data sheets identical to those used for existing Mark IF facility equipment. First article deliveries will be tested by the government for LRU interchangeability; complete assemblies may be tested (ground and flight checks) at field sites by the government prior to approving quantity production.

81. CHECKOUT. After installation of equipment by the regions, FAA personnel will conduct checkout tests in accordance with the procedure contained in the EEM's.

82. CONTRACTOR INTEGRATION TESTING. Not applicable.

83. CONTRACT ACCEPTANCE INSPECTION. Not applicable.

84. FAA INTEGRATION TESTING. Not applicable.

85. SHAKEDOWN AND CHANGEOVER. Not applicable.

86. JOINT ACCEPTANCE INSPECTION. Not applicable.

87-89. RESERVED.

CHAPTER 9. INTEGRATED LOGISTICS SUPPORT

90. MAINTENANCE CONCEPT. The FAA is responsible for on-site and depot-level maintenance of SLEP equipment procured by this project.

a. Site Maintenance. There are no changes to existing maintenance activities in Order 6750.49.

b. FAA Logistics Center Maintenance. The FAA Logistics Center will provide for maintenance of SLEP hardware identical to that for existing Mark IF like assemblies.

91. TRAINING. Training for SLEP hardware will not be provided as the equipment is identical to Mark IF equipment presently fielded at hundreds of sites. No hardware-specific activities are required for certification activities.

92. SUPPORT TOOLS AND TEST EQUIPMENT. No additional support tools or test equipment will be provided.

93. SUPPLY SUPPORT. The FAA Logistics Center is responsible for providing supply support to the SLEP hardware identical to that now provided for Mark IF ILS sites.

94. VENDOR DATA AND TECHNICAL MANUALS. Two sets of instruction books for the SLEP hardware will be provided via ordering instructions in the EEM effecting the hardware installation.

95. EQUIPMENT REMOVAL. Specific instructions for equipment removal and subsequent disposition will be contained in the EEM's.

96. FACILITIES. Not applicable.

97-99. RESERVED.

APPENDIX 1. MARK IB/C SLEP STAFF STUDY

The following pages in this appendix are copies of a brief staff study defining the concept of the Mark IB/C Service Life Extension Project (SLEP). The study was prepared by a working group of regional representatives at the request of the Landing Program Office.

MARK IB/C INSTRUMENT LANDING SYSTEM (ILS) SERVICE LIFE EXTENSION PROGRAM (SLEP) December 10, 1992

1. EXECUTIVE SUMMARY. Funding to replace existing Mark One B and One C (Mark IB/C) Instrument Landing Systems (ILS) has been withdrawn, even though these facilities may be called upon to support Instrument Flight Rules (IFR) operations to 2015 or beyond. Given a ban on replacement system procurements, a national working group proposes functional unit replacement of rack components with Mark IF equivalent units to upgrade all existing Mark IB/C facilities.

2. PROBLEM. Recently, the allocation of funds for Mark IB/C system replacement has been retracted as a result of FAA internal policies.

3. BACKGROUND. At present, parity of Microwave Landing Systems (MLS) and Global Positioning System (GPS) approaches with existing ILS approaches is scheduled for 2005. To date, the International Civil Aviation Organization (ICAO) has not announced a final projection date for ILS approaches. Even with only an 8-year phaseout period for ILS, this means present ILS systems must perform until at least 2013, and there are credible estimates for later years.

All Mark IA/B/C ILS facilities were scheduled for equipment replacement by an approved and funded ($121M) project in the Capital Investment Plan (CIP) to provide sustained IFR service well into the next century. During the past ten years, several National Maintenance Engineering Conferences have elevated the issue of the long term operational capabilities of the existing Mark IB/C equipment to their Top 10 Problem List, and the 1991 and 1992 Conferences have identified this issue as their first and second priorities. Due to the approved CIP project, the 1990 ILS Master Plan considered the Mark IB/C replacement program as a given.

In May, 1992, at a national Navigation Conference, the Program Manager for Landing, ANN-200 and the Associate Program Manager for Engineering, ANN-120, proposed the establishment of a national working group to develop and investigate various options to establish a service life extension program (SLEP) for the existing Mark IB/C facilities. The working group (Attachment 1) met in Washington, D. C., on August 11 and 12, 1992. It was given a broad range of options that excluded only full scale facility replacement. This document summarizes the results of that meeting and the group's recommendations.

4. FACTS BEARING ON THE PROBLEM.

a. The existing Mark IB/C facilities will be called upon to provide continued IFR service well into the twenty-first century. These facilities frequently serve smaller airports, with comparatively low numbers of IFR operations. As a result, they will likely be among the last facilities to either be replaced by MLS or prioritized for early development of a GPS approach.

b. The following table summarizes the number of fielded systems, which also include marker beacons:

	Mark IB	Mark IC	TOTAL
LOCALIZERS	81	39	120
GLIDE SLOPES	78	47	125

c. Mark IB/C facilities contribute a disproportionate number of unscheduled outages among the general ILS population. For example, in the Southwest Region, Mark IB localizers sustain twice the number of outages and twice the outage time per facility compared to the localizer population as a whole. Mark IB marker beacons account for 2.5 times the number of outages and over 3.5 times the outage time per facility compared to the marker beacon population as a whole, while Mark IC marker beacons account for five times the number of outages per facility as the marker beacon population as a whole.

d. Transmitter performance and maintainability have previously been an issue with the Mark IB, resulting in a national program to replace transmitters with Mark IF units.

e. Replacement of all Antenna Products Company (APC) traveling wave antennas (TWA's) has been funded, and will proceed starting in FY-93.

f. The fiscal resources originally designated for the Mark IB/C replacement program have not been reassigned, and remain available for Mark IB/C upgrades to extend their service life. The Mission Need Statement has been approved.

g. Major Systems Acquisitions are defined to be those exceeding $50M.

5. OPTIONS. The working group developed two basic actions that could be pursued in three different manners. They are:

a. Rack Replacement

1. Using existing technology and equipment types (Mark IF-like)

2. Using commercial-off-the-shelf (COTS) equipment

3. Via bids for newly-designed equipment

b. Unit Replacement

1. Using existing technology and equipment types (Mark IF-like)

2. Via bids for newly-designed equipment

6. ANALYSIS.

a. The working group, after considerable discussion, agreed on the following working assumptions:

1. Any life-extension program cost would have to be less than $50M, the threshold for a "Major System Acquisition".

2. ILS equipment will be in service for at least 22 years (through the year 2014).

3. Full provisioning is required for any proposed program.

4. Any proposed program would have one and only one procurement--e.g., all necessary parts for lifetime support would have to be procured at one time.

5. Any proposed program should result in a single standard configuration for Mark IB/C ILS locations, including a remote maintenance monitoring (RMM) readiness at least equivalent to the existing Airport Remote Monitoring System (ARMS).

b. The working group by consensus contrasted the five life extension options by ranking the following considerations:

	-Rack Replacement-			-Unit Replacement-	
	COTS	Mk IF-LIKE	BID	Mk IF-LIKE	BID
F&E Project?	YES	NO	YES	NO	YES
Standard Hardware?	NO	YES	NO	YES	NO
Time to Buy, Years	3-4	1-2	4-5	1-2	4-5
Cost for NAILS	Med-Hi	Low	Hi	Low	Hi
RMM	Full (Not 790)	Read-Only	Meets 790	Read-Only	Meets 790
Program Risk, 1-5	3	3	5(Hi)	1(Low)	3
Proven Design?	NO	YES	NO	YES	NO
Technical Risk, 1-5	3	1(Low)	3	2	5(Hi)
Program Cost, 1-5	2	2	3	1(Low)	5(Hi)

c. With a relatively small number of facilities supporting 125 instrument approaches, and a need to proceed in a timely manner before funds might become unavailable, the option of requesting bids for new equipment was quickly rejected as the minimum time requirement of four to five years was considered unsatisfactory.

d. The COTS option was also rejected, as any COTS equipment would introduce excessive NAILS costs associated with establishment of academy training, depot support, technical documentation, and recertification of maintenance personnel. In addition, while COTS equipment could be expected to have full RMM capabilities, it would likely not be compliant with specification NAS MD-790, and would not interface with the Tandem and Maintenance Command Center (MCC).

e. The vast majority of the existing ILS equipment inventory is composed of Mark ID/E/F sites. These facilities have exhibited high reliability with ease of maintenance. To date, depot level support has been satisfactory. These facilities are expected to be retained in service until replaced by a new technology. Upgrading existing Mark IB/C facilities to operational equivalence with Mark IF facilities capitalizes on existing training, experience, certification, and support infrastructure, and would standardize FAA's Category I ILS equipment on a single equipment type.

f. Mark IF-like equipment components can be procured two ways--via a sole source justification, or by competitive bidding for production of hardware identical to existing Mark-IF equipment using FAA-owned drawings.

g. NAS MD-790 RMM (read-only, without remote adjustment capabilities) can be retrofitted to Mark ID/E/F facilities with the purchase and installation of additional ARMS equipment.

h. The condition of Mark IB/C equipment shelters is unknown, as many regions have already replaced some of them. The regions have sharply-divided opinions on how shelters should be procured--nationally or regionally.

i. The working group's priorities for various system components and estimated costs from recent individual regional procurements are tabulated below. The estimated costs are for hardware only, without any installation.

PRIORITY	ITEM	EST. COST
1	Mark IC Transmitters/Modulators	$ 2.4M
2	Monitor/Detectors/Power Supply/ Batteries/Battery Box/ Control Unit/Surge Protectors	$15.0M
3	Eight- and 14-element Distribution Units	$ 0.6M
4	CEGS Clearance Transmitters	$ 0.4M
5	SBRGS/CEGS Amplitude and Phase Control Units	$ 0.5M
6	Marker Beacons	$ 4.5M
7	Monitor Combining Units (LOC/GS a/r)	$ 0.8M
8	Localizer antenna refurbishment (coaxial cable/troughs/cable fault/ pedestals/etc.)	$ 2.3M
9	Metal work for equipment racks	$ 0.1M
(10)	Shelters (wholesale replacement)	($ 5.4M)
11	Power panels (RF bodies and meters)	$ 0.3M
	TOTAL ESTIMATED COST (without shelters)	$26.9M
	TOTAL ESTIMATED COST (with shelters)	$32.3M

NOTE: The above costs are based on recent quantity-1 purchase by the regions, and are surely high "worst case" values. Quantity purchases may well result in figures approximately 30% lower.

j. Various installation options exist utilizing mixes of F&E, regional operations, and sector personnel resources. The costs associated with installation were addressed by three basic installation techniques:

1. By traditional F&E project

2. By region or sector tiger teams

3. By local technician work force

k. "Available funds" is defined to be less than the $50M MSA threshold. Assuming shelter procurement is NOT included, funds for installation cannot exceed approximately $80K per localizer and glide slope location.

l. Installation by F&E will result in much higher overall costs, since a 2:1 ratio between installation and hardware costs is typical. (Note that use of F&E for installation will limit the scope of this proposal to only the first two line items in the priority list.) Based on working group estimates from recent regional procurements, available funds would allow for the purchase of all desired equipment, but would not fund full F&E installations.

m. Installation by any combination of regional/sector tiger teams or the local technician workforce appears viable, since it would exploit the high level of eagerness to replace the existing old equipment and would be less expensive than an F&E project. Further, it would represent an opportunity to develop and use the sector technical staffs.

n. Due to various regional improvement activities and in-process programs, there are too many variations in the Mark IB/C locations for a single nation-wide installation program.

o. Fifteen-element V-Ring antenna systems are frequently the cause of localizer outages and maintenance problems. Conversion to either 8- or 14-element configurations offers increased stability and ease of maintenance for comparatively low material costs. Most regions have already begun an aggressive effort to do this with local funding.

p. There is little consensus among the regions on whether a national or local shelter procurement should be made. The workgroup determined that the shelters should be replaced via regional efforts if required.

7. CONCLUSIONS:

a. Continued maintenance of these facilities will become increasingly difficult as serviceable replacement parts and new components become less readily available.

b. The safety of the flying public, the reputation of the services provided by the FAA, and the morale of our technical work force would all be jeopardized by inaction during the remaining 22 or more years of ILS service to be provided by Mark IB/C systems.

c. A life-extension program consisting of the replacement of system components in a prioritized order is justifiable for less-than-MSA costs, if installation is performed by non-F&E sector/regional personnel.

d. While recognizing the work and costs involved in such refurbishments, regions and sectors will be willing to undertake such projects to gain the benefits they will certainly obtain in enhanced facility performance and ease of maintenance.

e. Procurement of needed life-extension components should be via either sole-source justification for equipment identical to existing Mark IE/F systems from the original manufacturer or via competitive bids on identical equipment using FAA-owned Mark IE/F drawings.

f. Equipment should be made available to the regions to allow complete upgrade of the equipment rack to parity with the Mark IE/F equipment. Materials should be made available to support full refurbishment and conversion of existing fifteen element V-Ring localizer antennas to either 8- or 14-element configurations.

8. RECOMMENDATIONS.

a. Replace Mark IB/C system components with Mark IE/F-type components, in the priority order defined in ANALYSIS paragraph (i).

b. Procure needed components either through specified fabrication bids or sole source through the original manufacturer.

c. Send installation funds to the regions through Project Authorizations.

d. Ship items 1 and 2 in the priority list to each site, for installation via a method determined at regional discretion.

e. Place items 3-5 in the priority list at the depot for regional ordering.

f. Prepare a draft Program Installation Plan, containing the fundamental portions of this document, and coordinate with the regions. (This is essential to obtain their commitment to the proposed installation method. Further, their full participation in detailed program definition and procurement activities will be essential.)

g. Plan the life-extension program to begin during FY-95.

9. ACKNOWLEDGEMENTS. The participation of ILS personnel from all regions, ASM-100, AML-460, and AOS-200 was essential for the working group to obtain a widely-based consensus, and their contributions were valuable. The ILS Program Office members (ANN-120 and ANN-200) are to be commended for promoting the workgroup concept, allowing full regional participation in a policy arena with intense interest. Finally, although this document was assembled by the author, the significant text contributions from Messrs. Lee Traweek of Southwest Region and Jim Ruf of Central Region made the effort considerably easier.

Original Signed By:

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Special Projects Engineer
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Mark IB/C Service Life Extension Program (SLEP)
Working Group Members
August 11-12, 1992

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APPENDIX 2. MARK IB/C SITES BY REGION

The following pages define the June 16, 1994 list of candidate Mark IB/C sites.

The COMMENTS column reflects regional plans for optional conversion (by the regions) of 15-element V-Ring antenna arrays to either the 8- or 14-element configuration.

CAT 1 INSTRUMENT LANDING SYSTEM (ILS) POTENTIAl SLEP SITES Date Posted:11/04/93

REG	ST	LOCATION	RW	ID	LOC	ANT	GS	ANT	COMMENTS
AAL	AK	BARROW	06	BRW	MK-1A	VR-14	MK-1C	NR	
		BETHEL	18	BET	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		CORDOVA	27	CDV	MK-1A	VR-15	MK-1D	NR	V-RING CONV DATE
		DEADHORSE	04	SCC	MK-1C	VR-14	MK-1C	NR	
		HOMER	03	HOM	MK-1B/1F	VR-15			
		KETCHIKAN	11	ECH	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		KODIAK	25	ADQ	MK-1B	LPD-14	MK-1D	CE	
		NOME	27	OME	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATE
		YAKATAT	11	YAK	MK-1B/1F	VR-14	MK-1D	NR	
ACE	1A	BURLINGTON	36	BRL	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATE
		DUBUQUE	31	DBQ	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATE
		MASON CITY	35	MCW	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		OTTUMWA	31	OTM	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE
	KS	WICHITA	19R	HOV	MK-1B/1F	LPD	MK-1B/1F	CE	
	MO	CAPE GIRARD	10	CGI	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE
		CHESTERFIELD	O8R	SUS	412	VR-15	412	NR	V-RING CONV DATE
		COLUMBIA	02	COU	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATE
		ST LOUIS	30L	BKY	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE
	NE	SCOTTSBLUFF	30	BFF	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		GRAND ISLAND	35	GRI	MK-1A	VR-15	MK-1A	NR	REPLACEMENT SITE DEMO
AEA	MD	SALISBURY	32	SBY	MK-1B/1F	LPD	MK-1B/1F	NR	
	NJ	MORRISTOWN	23	MMU			MK-1C/1F	SB	

CAT 1 INSTRUMENT LANDING SYSTEM (ILS) POTENTIAl SLEP SITES Date Posted:11/04/93

REG	ST	LOCATION	RW	ID	LOC	ANT	GS	ANT	COMMENTS
		TEMPLE	15	TPL	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		WACO	17L	CNW	MK-12	TWA	MK-12	NR	_____
AWP	AM	SAMOA TAFU	05	TUT	MK-1C	VR-15	MK-1C	CE	V-RING CONV DATE_____
	AZ	PHOENIX	OBR	PHX	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		TUSCON	11L	TUS	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		YUMA	21R	YUM	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____
	CA	CRESCENT CITY	11	CEC	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____
		EL CAJON	27	SEE	MK-12	TWIN-T			_____
		LOS ANGELES	06R	GPE	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATE_____
		LOS ANGELES	07L	IAS	MK-1A	VR-15	MK-1A	CE	V-RING CONV DATE_____
		MERCED	30	MCE	MK-1C	TW-8	MK-1C	NR	_____
		MODESTO	28R	MOD	MK-1C	VR-15	MK-1C	SB	V-RING CONV DATE_____
		PALMDALE	25	PMD	MK-12	TW-12	MK-12	NR	_____
AWP	CA	REDDING	34	RDD	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		SALINAS	31	SNS	MK-1C	VR-15	MK-1C	SB	V-RING CONV DATE_____
		SANTA MARIA	12	SMX	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		SANTA ROSA	32	STS	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____
		TORRANCE	29R	TOA	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
	GU	AGANA	06R	GUM	MK-1C	VR-15	MK-1C	CE	V-RING CONV DATE_____
	HI	KONA HAWAII	17	KOA	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		OAHU HONOLULU	04R	IUM	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____

CAT 1 INSTRUMENT LANDING SYSTEM (ILS) POTENTIAl SLEP SITES Date Posted:11/04/93

REG	ST	LOCATION	RW	ID	LOC	ANT	GS	ANT	COMMENTS
		HATTIESBURG	18	PIB	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____
		MCCOMB	15	MCB	MK-1A	VR-8			FY-93 GS MANDATE
	NC	KINSTON	05	ISO	MK-1C	VR-15	MK-1C	SB	V-RING CONV DATE_____
	SC	FLORENCE	09	FLO	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		NO MYRTLE BCH	23	CRE	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____
	TN	CROSSVILLE	25	CSV	MK-1C	VR-8	MK-1C	NR	_____
		JACKSON	02	MKL	MK-1C	VR-15	MK-1C	SB	V_RING CONV DATE_____
		MEMPHIS	18L	SDU	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
	VI	ST CROIX	09	STX	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATA_____
ASW	AR	FAYETTEVILL	16	FYV	MK-1B/1F	VR-15			V-RING CONV DATE_____
		TEXARKANA	22	TXK	MK-1A	VR-15	MK-1A	NR	V-RING CONV DATE_____
	LA	NEW ORLEANS	18R	NEW	MK-1A	VR-15	MK-1D	NR	V-RING CONV DATE
		NEW ORLEANS	01	JFI	MK-1B/1F	VR-15	MK-1F	SB	V-RING CONV DATE_____
	NM	HOBBS	03	HOB	MK-12	VR-8	MK-12	NR	_____
ASW	NM	ROSWELL	21	ROW	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
	OK	OKLAHOMA CITY	17R	OKC	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
	TX	BROWNSVILLE	13R	BRO	MK-1F	VR-8	MK-1B/1F	NR	_____
		COLLEGE STA	34	CLL	MK-1B/1F	VR-15	MK-1F	SB	V-RING CONV DATE_____
		HARLINGEN	17R	HRL	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		HOUSTON	14L	HSQ	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		LAREDO	17R	LRD	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		MCALLEN	13	MFE	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____

CAT 1 INSTRUMENT LANDING SYSTEM (ILS) POTENTIAl SLEP SITES Date Posted:11/04/93

REG	ST	LOCATION	RW	ID	LOC	ANT	GS	ANT	COMMENTS
	WY	SHERIDAN	31	SHR	MK-1B/1F	VR-15	MK-1B-1F	CE	V-RING CONV DATE_____
ASO	AL	ANNISTON	05	ANB	MK-1A	VR-15	MK-1D	NR	V-RING CONV DATE_____
		DOTHAN	31	DHN	MK-1A	VR-15	MK-1C	NR	V-RING CONV DATE_____
		MUSCLE SHOAL	29	MSL	MK-1A	VR-15	MK-1C	CE	V-RING CONV DATE_____
		TUSCALOOSA	04	TCL	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
	FL	GAINESVILLE	28	GNV	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____
		MELBOURNE	09R	MLB	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		MIAMI	27R	VIN	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____
		SARASOTA	32	SRQ	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		ST PETERSBURG	17L	PIE	MK-1A	VR-8	MK-1F	NR	_____
	GA	ALBANY	04	ABY	MK-1B/1F	VR-15	MK-1B/1F	NR	_____
		ATLANTA	26L	BRU	DUAL MK-1	VR-15	MK-1B/1F	CE	V-RING CONV DATE_____
		ATLANTA	27L	FSQ	DUAL MK-1	VR-15	MK-1B/1F	CE	V-RING CONV DATE_____
		CHAMBLEE	20L	PDK	MK-1B/1F	VR-15	MK-1E	WG	V-RING CONV DATE_____
		FULTON COUNTY	08R	FTY	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATE_____
ASO	GA	VALDOSTA	35	VLD	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE_____
	KY	COVINGTON	09R	URN	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATE_____
		LOUISVELLE	19	ADO	MK-1B/1F	VR-15	MK-1D	NR	V-RING CONV DATE_____
		OWENSBORO	35	OWB	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____
		PADUKAH	04	PAH	MK-1B/1F	VR-15	MK-1B/1F	SB	V-RING CONV DATE_____
	MS	COLUMBUS	18	GTR	MK-1A	VR-15	MK-1C	CE	V-RING CONV DATE_____
		GREENVILLE	18L	GLH	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE_____

CAT 1 INSTRUMENT LANDING SYSTEM (ILS) POTENTIAl SLEP SITES Date Posted:11/04/93

REG	ST	LOCATION	RW	ID	LOC	ANT	GS	ANT	COMMENTS
		ROCKLAND	03	RKD	MK-12	LPD			
	VT	MONTPELIER	17	MPV	MK-1B/1F	LPD	MK-1B/1F	CE	
		RUTLAND	19	RUT	MK-1A	LPD			LOC TWA-DU
		SPRINGFIELD	05	VSF	MK-1A	NERA-6			
ANM	CO	BROOKFIELD	29R	BJC	MK-1F	LPD	MK-1C	SB	
		DENVER	08R	GQW	MK-1E	LPD	MK-1C	SB	Stapleton(to close)
		DENVER	17L	HMX	MK-1C	LPD	MK-1D	SB	Stapleton(to close)
	ID	BOISE	10R	BOI	MK-1F	VR-8	MK-1A/1F	NR	
		IDAHO FALLS	20	IDA	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		LEWISTON	26	LWS	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		TWIN FALLS	25	TWF	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
	MT	BOZEMAN	12	BZN	MK-1C	VR-8	MK-1C	NR	
		HELENA	26	HLN	MK-1B/1F	VR-8	MK-1B/1F	CE	
		KALISPELL	02	FCA	MK-1C	VR-15	MK-1C	NR	V-RING CONV DATE
		MISSOULA	11	MSO	MK-1B/1F	VR-8	MK-1B/1F	NR	
	OR	NORTH BEND	04	OTH	MK-1F	LPD	MK-1C	SB	
ANM	UT	SALT LAKE CITY	16L	BNT	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		EVERETT	16	PAE	MK-II	LPD	MK-II	CE	LOC=REDLICH
		OLYMPIA	17L	OLM	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		PASCO	21R	PSC	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV DATE
		TACOMA	17	TIW	MK-1A	VR-15	MK-1D	SB	V-RING CONV DATE
		WALLA WALLA	20	ALW	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV DATE

CAT 1 INSTRUMENT LANDING SYSTEM (ILS) POTENTIAl SLEP SITES Date Posted:11/04/93

REG	ST	LOCATION	RW	ID	LOC	ANT	GS	ANT	COMMENTS
		MINNEAPOLIS	22	SIJ	MK-1E	LPD	MK-1A	NR	
		ST PAUL	32	BAO	MK-1B/1F	VR-15	MK-1F	CE	V-RING CONV 10/97 VR-14
	ND	GRAND FORKS	35	GFK	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV 7/97 VR-14
		JAMESTOWN	30	JMS	MK-1C	VR-15	MK-1B/1F	NR	V-RING CONV 7/99 VR-14
		MINOT	31	MOT	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV 2/98 VR-8
	OH	CLEVELAND	23L	HPI	MK-1B/1F	VR-15	MK-1B/1F	SB	V-RING CONV 5/97 VR-14
		DAYTON	18	DAY	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV 10/96 VR-8
		CUYAHOGA	23	CGF	MK-1C	VR-15	MK-1C	CE	V-RING CONV 6/99 VR-8
	SD	ABERDEEN	31	ABR	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RINF CONV 10/99 VR-8
		PIERRE	31	PIR	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV 6/98 VR-8
		WATERTOWN	35	ATY	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV 10/98 VR-14
	WI	EAU CLAIRE	22	EAU	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV 7/98 VR-14
		LACROSSE	18	LSE	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV 7/97 VR-8
		MILWAUKEE	19R	BLY	MK-1A	VR-15	MK-1C	CE	V-RING CONV 4/96 VR-14
		MILWAUKEE	7R	GMF	MK-1A	TWA	MK-1F	CE	5/95 TO LPD
		MOSINEE	08	CWA	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV 8/97 VR-8
ANE	CT	GROTON	05	GON	MK-1D	LPD	MK-1B/1F	SB	
ANE	CT	NEW HAVEN	02	HVN	MK-1B/1F	VR-15	MK-1B/1F	SB	V-RING CONV DATE
	MA	BOSTON	15R	MDC	MK-1C	TW-8	MK-1C	NR	
		LAWRENCE	05	LWM	MK-1A	LPD-8	MK-1F	NR	TWA-DU
		WESTFIELD	20	BAF	MK-1C	VRF-15	MK-1C	SB	V-RING CONV DATE
	ME	LEWISTON	04	LEW	MK-12/1F	TW-8	MK-1E	CE	LOC MON MK-12

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REG	ST	LOCATION	RW	ID	LOC	ANT	GS	ANT	COMMENTS
		PARKERSBURG	03	PKB	MK-1A	VR-8	MK-1B/1F	CE	V-RING CONV DATE__94__
AGL	IL	BLOOMINGTON	29	BMI	MK-IC	VR-15	MK-1C	CE	V-RING CONV 10/98 VR-8
		CARBONDALE	18	MDH	MK-1A	TWA	MK-1A	CE	6/95 CONVERT TO LPD___
		MIDWAY	04R	HKH	MK-1E	14 LPD	MK-1B/1F	NR	
		STERLING	25	SQI	MK-1C	VR-15	MK-1C	CE	V-RING CONV 10/99 VR-8
		WAUKEGAN	23	UGN	MK-1A	TWA	MK-1F	NR	6/95 CONVERT TO LPD___
		DUPAGE	10	DPA	MK-1D	VR-15	MK-1D	CE	6/96 CONVERT TO VR-8__
	IN	GARY	30	GYY	MK-1A	LPD	MK-1E	CE	_____
		LAFAYETTE	10	LAF	MK-1F	LPD	MK-1B/1F	CE	_____
		VALPARAISO	27	VPZ	MK-1A/1F	VR-8	MK-1F	CE	_____
	MI	BENTON HARBOR	27	BEH	MK-1F	VR-15	MK-1B/1F	NR	V-RING CONV 4/97 VR-8_
		HOUGHTON	31	CMX	MK-1A	VR-15	MK-1A	NR	V-RING CONV 4/96 VR-14
		IRON MOUNTAIN	01	IMT	MK-1B/1F	VR-15	MK-1B/1F	NR	V-RING CONV 8/99 VR-8_
		LANSING	27L	LAN	MK-1F	LPD	MK-1C	NR	_____
		MARQUETTE	O8	MQT	MK-1B/1F	VR-15	MK-1C	CE	V-RING CONV 9/99 VR-8_
		PELLSTON	32	PLN	MK-1B/1F	VR-15	MK-1B/1F	NR	10/99 TO VR-8
		PONTIAC	09R	PTK	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV 3/97 VR-8
		DETROIT METRO	27	DMI	MK-1A/1E	VR-15	MK-1A/1E	NR	V-RING CONV 2/96 VR-14
AGL	MI	TRAVERSE CITY	28	TVC	MK-1A	VR-15	MK-1A	NR	V-RING CONV 6/97 VR-8_
	MN	HIBBING	31	HIB	MK-1B/1F	VR-15	MK-1B/1F	CE	V-RING CONV 3/96 VR-8_
		INT FALLS	31	INL	MK-1A	VR-15	MK-1A	NR	V-RING CONV 9/96 VR-14
		MINNEAPOLIS	11R	HKZ	MK-1E	LPD	MK-1A	CE	_____

CAT 1 INSTRUMENT LANDING SYSTEM (ILS) POTENTIAl SLEP SITES Date Posted:11/04/93

REG	ST	LOCATION	RW	ID	LOC	ANT	GS	ANT	COMMENTS
	NY	GLEN FALLS	01	GFL	MK-1C	TWA	MK-1C	CE	
	PA	DUBOIS	25	DUJ			MK-1C	NR	
		HARRISBURG	08	CXY	MK-1B/1F	TWA	MK-1B/1F	SB	
		HAZELTON	28	HZL	MK-1A	VR-8			V-RING CONV DATE 93
		JOHNSTOWN	33	JST	MK-1B/1F	VR-8	MK-1B/1F	SB	
		LANCASTER	08	LNS	MK-1A/1F	VR-8	MK-1A/1F	SB	V-RING CONV DATE 93
		PHILADELPHIA	27R	PDP	MK-1A/1F	VR-8	MK-1A/1F	SB	V-RING CONV DATE 94
		PHILIPSBURG	16	PSB	MK-1C	VR-14	MK-1C	NR	V-RING CONV DATE 94
		REEDSVILLE	06	RVL	MARK 12	VR-8			V-RING CONV DATE 94
		WILLIAMSPORT	27	IPT	MK-1A/1F	VR-14	MK-1C/1F	SB	
	VA	CHANTILLY	19L	SGC	MK-1C/1F	VR-14	MK-1C/1F	CE	V-RING CONV DATE 94
		CHARLOTT'VILLE	03	CHO		TWA		SB	
		DUBLIN	06	PSK	MK-1B/1F	VR-8	MK-1A/1F	SB	
		RICHMOND	16	RGJ	MK-1B/1F	VR-14	MK-1A/1F	NR	V-RING CONV DATE 94
		STAUNTON	04	SHD		VR-15	MK-1C/1F	CE	V-RING CONV DATE
	WV	BLUEFIELD	23	BLF	MK-1C/1D	TWA	MK-1C	SB	
		CLARKSBURG	21	CKB	MK-1B/1F	VR-8	MK-1B/1F	SB	V-RING CONV DATE
		ELKINS	22	OUW	MK-1A/1F	VR-8			
		HUNTINGTON	12	HTS		VR-8	MK-1B/1F	CE	V-RING CONV DATE 94
AEA	WV	LEWISBURG	04	LWB	MK-1B/1F	VR-8	MK-1B/1F	SB	V-RING CONV DATE 94
		MARTINSBURG	26	EXW	MK-1B/1F	VR-8			
		MORGANTOWN	18	MGW	MK-1B-1F	VR-8	MK-1B/1F	SB	V-RING CONV DATE 94